

Physics & Astronomy Colloquium

Presents

Jason Stoke

Eastern Washington University

Thursday, September 19, 2019

4:10 pm, Webster Room 17

“Characterization of Solar Cell Thin Films using Spectroscopic Ellipsometry”

Spectroscopic ellipsometry (SE) is an ideal method for analyzing optical, structural and electrical properties of transparent thin films due to its non-destructive nature and nanometer scale sensitivity. These attributes make SE an attractive technique for investigating the thin films incorporated into cadmium telluride (CdTe) based solar cells. Two areas of interest in terms of understanding CdTe solar cell optimization are the transparent conducting oxide (TCO) layer and the intersection of the p-n junction consisting of CdTe and cadmium sulfide (CdS) layers, respectively.

Cadmium stannate Cd₂SnO₄(CTO) thin films are an alternative to indium tin oxide TCO material, due to the high cost of indium. In order for CTO to be a viable alternative TCO material, its nature or “character” must be investigated along with correlations between process parameters and solar cell device performance. CTO thin films were characterized using spectroscopic ellipsometry (SE) along with Hall probe and X-ray diffraction (XRD) data in order to investigate correlations between process parameters and thin film optical and electrical properties.

Cadmium telluride (CdTe) based solar cells present a unique challenge in terms of ‘film side’ spectroscopic ellipsometry (SE) analysis due to its superstrate configuration. In this configuration, the n-type cadmium sulfide (CdS) layer is deposited before the p-type CdTe material. The thick optically absorbing CdTe layer prevents light at photon energies above ~1.5 eV from penetrating down to the CdS layer and reflecting back to the detector. In order to obtain information about the CdS layer and interface with the CdTe layer, SE data must be taken through the glass substrate. Optical models were developed in tandem with XRD data to characterize the p-n junction of CdTe solar cells.”

Please meet our guest speaker and share in refreshments 3:45-4:10 p.m. in the foyer on floor G above the lecture hall

Host: Dr. Matt McCluskey



PHYSICS AND ASTRONOMY

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